Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application. In this listing of claims, claims 1 and 17 have been amended. Claims 16 and 26 have been cancelled.

Listing of Claims:

1. (Currently Amended) An electrochemical system comprising

a plurality of cells;

a measuring device including a plurality of inputs connected across the plurality of cells to generate voltage and current signals indicative of voltage and current characteristics of the plurality of cells;

a load powered by the plurality of cells;

a current supply/draw means for superimposing modulated current values through the plurality of cells; and,

a controller for controlling at least one system operating condition based on the voltage and current characteristics received from the measuring device, the controller being connected to the measuring device, wherein the at least one system operating condition comprises ~~comprising~~ at least one of temperature, humidity, and reactant flow rates, within the electrochemical system and the load is connected to the plurality of cells in parallel with the current supply/draw means.

2. (Original) The electrochemical system as defined in claim 1 wherein the current supply/draw means comprises a modulator.

3. (Original) The electrochemical system as defined in claim 2 wherein the modulator is an integral part of the controller.

4. (Original) The electrochemical system as defined in claim 2 wherein the plurality of inputs are connected across individual cells in the plurality of cells and the modulator is operable to superimpose modulated current values through the individual cells.

5. (Original) The electrochemical system as defined in claim 2 wherein the controller is operable to control, in real time, the at least one system operating condition based on the voltage and current characteristics received from the measuring device.

6. (Original) The electrochemical system as defined in claim 2, wherein the controller is operable to alert an operator based on alarm conditions determined from the voltage and current characteristics received from the measuring device.

7. (Original) The electrochemical system as claimed in claim 2, wherein the modulator is arranged to superimpose the modulated current values in burst time periods for high frequency resistance measurement, with time periods between burst time periods of no superimposition of modulated current values.

8. (Original) The electrochemical system as claimed in claim 2, wherein the measuring device provides a plurality of primary channels for the measured voltage and current signals, there being one channel for the voltage across each cell, and wherein the measuring device includes a splitter for separating out at least the DC components of the voltages across the individual cells from the primary channels, the splitter having first channels as outputs for the DC components.

9. (Original) The electrochemical system as claimed in claim 8, wherein the splitter includes second channels as outputs for the AC components of the voltages across the individual cells.

10. (Original) The electrochemical system as claimed in claim 8, wherein the measuring device includes a plurality of instrumentation amplifiers connected to the inputs of the measuring device and having outputs providing the plurality of the primary channels and an analog multiplexer connected to at least the first channels

from the channel splitter, wherein a multiplexer control line is connected between the controller and the analog multiplexer for controlling the analog multiplexer to switch sequentially between at least the first channels.

11. (Original) The electrochemical system as claimed in claim 10, which further includes a first analog to digital converter connected to the output of the analog multiplexer, a voltage data bus connected between the first analog to digital converter and the controller and an analog to digital control line connected between the controller and the first analog to digital converter for control thereof.

12. (Original) The electrochemical system as claimed in claim 11, wherein a current sensing device is provided connected in series with the individual cells for measuring the current, wherein the current sensing device is connected to the controller.

13. (Original) The electrochemical system as claimed in claim 12, wherein outputs of the current sensing device are connected to a current amplifier and wherein the current amplifier has an output for a current measurement signal connected to the controller.

14. (Canceled)

15. (Original) The electrochemical system as claimed in claim 2, wherein the controller includes an input, connectable to a computing device for supply of control signals for controlling the controller.

16. (Canceled)

17. (Currently Amended) A method of controlling at least one system operating condition of a multi-cell electrochemical system, the method comprising:

(a) superimposing modulated current values across a plurality of cells of the electrochemical device;

(b) drawing current from the plurality of cells to generate voltage and current signals indicative of voltage and current characteristics of the plurality of cells;

(c) driving a load using a load current drawn from the plurality of cells in parallel with the current drawn in step (b); and,

(d) controlling the at least one system operating condition based on the voltage and current characteristics of the plurality of cells, wherein the at least one system operating condition comprises at least one of temperature, humidity, and reactant flow rates, within the electrochemical system.

18. (Original) The method as defined in claim 17 wherein step (a) comprises superimposing the modulated current values across individual cells in the plurality of cells; and step (b) comprises drawing current from the individual cells to generate voltage and current signals indicative of voltage and current characteristics of the individual cells.

19. (Original) The method as claimed in claim 17, wherein step (a) is performed in burst time periods for high frequency resistance measurement, with time periods between burst time periods of no superimposition of modulated current values.

20. (Original) The method as claimed in claim 19, wherein step (a) comprises controlling the superimposing to provide a series of set interference conditions, and measuring, for each interference condition, at least some of the voltage and current characteristics of the electrochemical device.

21. (Original) A method as claimed in claim 20 wherein step (a) comprises varying a frequency of the superimposed current values; step (b) comprises generating the voltage and current signals at selected frequencies for the superimposed modulated current values, and determining from the voltage and current signals a plurality of real and imaginary components of the impedance of the individual cells; and, step (c) comprises controlling the at least one system operating condition based on the plurality of real and imaginary components of the impedance of the individual cells.

22. (Original) A method as claimed in claim 19, wherein step (b) comprises connecting inputs of a plurality of differential amplifiers across individual cells of the electrochemical device, measuring the voltage and current of the cells with the plurality of differential amplifiers to generate the voltage and current signals, supplying the voltage and current signals to a multiplexer and operating the multiplexer to sequentially supply the voltage and current signals to a controller for performing step (c).

23. (Original) A method as claimed in claim 22, further comprising converting each voltage and current signal selected by the analog multiplexer to a digital signal in a voltage analog to digital converter.

24. (Original) A method as claimed in claim 23, further comprising providing a current sensing device connected in series with the cells for measuring the current through the load, measuring the voltage across the current sensing device to determine the current through the load and thereby generating a current measurement signal, and supplying the current measurement signal to the controller.

25. (Original) A method as claimed in claim 24, further comprising converting the current measurement signal to a digital current measurement signal, and supplying the digital current measurement signal to the controller.

26. (Canceled)